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ABSTRACT

This guide outlines the topics of instruction and goals/objectives of a semester-long half-unit laboratory course in forestry and wood technology (Agriscience 383) that is designed for students part of Texas' agricultural science and technology program for students in grades 10-12. Presented first are lists of the following: essential elements common to all agricultural science and technology courses offered by Texas schools, essential elements specific to Agriscience 383, and the course's units and subtopics of instruction along with the suggested time allocated for each unit and the catalog numbers of Instructional Materials Service (IMS) curriculum materials that teachers may use to teach each topic/subtopic. The remainder of the guide lists the objectives to be met upon completion of each of the following course topics along with the corresponding IMS materials: the historical significance of forestry; forest dendrology, forestry biometrics, and forestry management skills; pine and hardwood forest utilization practices; the role of wood technology in forest product development; trends in research and development in forestry and wood technology; career opportunities in forestry and wood technology; management of records related to forestry and wood technology; and planning/conduct of leadership activities related to forestry and wood technology. (MN)

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CURRICULUM GUIDE

FOR

AGRISCIENCE 383

FORESTRY AND WOOD TECHNOLOGY

Developed
by

INSTRUCTIONAL MATERIALS SERVICE

DEPARTMENT OF AGRICULTURAL EDUCATION

TEXAS A & M UNIVERSITY

COLLEGE STATION, TEXAS

in
Consultation
with

TEMPLE-INLAND

FOREST PRODUCTS CORPORATION

DIBOLL, TEXAS

in
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with

TEXAS EDUCATION AGENCY

CAREER AND TECHNOLOGY EDUCATION

AGRICULTURAL SCIENCE AND TECHNOLOGY

AUSTIN, TEXAS

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USING THE CURRICULUM GUIDE FOR AGRISCIENCE 383

Agriscience 383 - Forestry and Wood Technology - is one of various experimental semester courses in Agricultural Science and Technology. The course introduces students, in grades 10 - 12 in public secondary schools, to the forestry and wood technology industries. Students develop technical skills in dendrology, biometrics, management, utilization and safety, and research. Also included are agricultural career development, leadership activities, and recordkeeping.

While the primary purpose in the development of this curriculum guide is to assist the teacher in presenting the course, the guide may be used in other ways.

Pages 1 - 2 of this guide include a list of essential elements common to all career and technology courses. A list of essential elements specific to the course is on page 3.

Pages 4 - 6 of this guide contain a list of units and topics of instruction with a suggested time (periods of instruction) allocated for each unit and topic. In addition, each topic is referenced to the essential elements listed on pages 1 - 3. Listed also are catalog numbers of Instructional Materials Service (IMS) curriculum materials that may be used in teaching topics and satisfying essential element requirements. More than one suggested item of curriculum materials may be listed for effective instructional presentation of some topics. If all suggested curriculum materials listed are used, the essential element requirements of the course will be met.

The next section (pages 7 - 22) in the guide provides the goal and objectives to be met upon completion of each topic. This section should be particularly useful to teachers in preparing lesson plans.

Each student material topic contains a list of references used in its development. If a more detailed presentation of subject matter is necessary, the teacher may acquire some of these references from IMS and/or the publishers cited in the reference section of each student material topic.

ESSENTIAL ELEMENTS COMMON TO ALL AGRICULTURAL SCIENCE AND TECHNOLOGY COURSES

S_S75.82 Agricultural Science and Technology

(a) The elements in this subsection are common to all agricultural science and technology courses unless otherwise indicated and shall be included in each course at the appropriate level. Every school offering agricultural science and technology shall provide courses which include the following essential elements:

(1) Leadership concepts and skills. The student shall be provided opportunities to:

(A) demonstrate skills, characteristics and responsibilities of leaders and effective group members;

(B) demonstrate a knowledge of parliamentary procedure principles;

(C) plan and conduct leadership activities; and

(D) prepare for effective citizenship and participation in our democratic society.

(2) Concepts and skills related to successful employment and/or post secondary training. The student shall be provided opportunities to:

(A) identify employment opportunities and preparation requirements in chosen field;

(B) identify effective methods to secure and terminate employment;

(C) demonstrate effective communication skills, both oral and written, and follow through on assigned tasks;

(D) demonstrate dependability and punctuality;

(E) demonstrate productive work habits and attitudes;

(F) understand the importance of taking pride in the quality of work performed;

(G) recognize the dignity in work;

(H) develop skills in planning and organizing work;

(I) apply required methods and sequences when performing tasks;

(J) apply principles of time management and work simplification when performing assigned tasks;

(K) identify ethical practices and responsibilities; and

(L) understand the importance of the application of organizational policies and procedures.

(3) Concepts and skills associated with entrepreneurship. The student shall be provided opportunities to:

(A) identify opportunities for business ownership;

(B) understand the risk and profit motive factor;

(C) understand the elements and advantages of the free enterprise system; and

(D) explain the role of small business in the free enterprise system.

(4) Concepts and skills related to safety and safe working conditions. The student shall be provided opportunities to identify and apply safe working practices to all training situations.

(5) Concepts and skills associated with human relations and personality development. The student shall be provided opportunities to:

(A) understand the importance of maintaining good health and proper appearance for effective job performance;

(B) understand oneself and others;

(C) exercise self-control;

(D) accept and use criticism;

(E) recognize basic human relationships as they relate to business success; and

(F) demonstrate characteristics for successful working relationships.

(6) Concepts and skills related to personal and business management. The student shall be provided opportunities to:

(A) explain how management assists in reaching personal and family goals;

(B) explain the management process;

(C) describe the role of management in controlling stress;

(D) identify and understand personal checking accounts;

(E) identify and understand personal loan application processes;

(F) identify and understand different financial institutions;

(G) identify the role and functions of business management;

(H) understand the lines of authority; and

(I) identify effective supervisory techniques.

(7) Concepts and skills related to supervised agricultural activities. The student shall be provided opportunities to plan and conduct/perform supervised agricultural activities.

S_S75.82 Agricultural Science and Technology

Agriscience 383 - Forestry and Wood Technology (1/2 unit) - shall be a shop/laboratory-oriented course that includes the essential elements and the concepts and skills related to forestry and wood technology. The student shall be provided opportunities to:

(1) explore the historical significance of forestry;

(2) practice forestry dendrology skills;

(3) learn forestry biometrics skills (mensuration techniques and tools);

(4) perform forestry management skills;

(5) recognize pine and hardwood forest utilization practices, including safety procedures;

(6) describe the role of wood technology in forest product development;

(7) identify trends in research and development (R&D) in forestry and wood technology;

(8) explore career opportunities in forestry and wood technology;

(9) manage records related to forestry and wood technology; and

(10) plan and conduct leadership activities related to forestry and wood technology.

AGRISCIENCE 383

FORESTRY AND WOOD TECHNOLOGY

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials*
A. Explore the Historical Significance of Forestry	5		
1. Introducing Forestry Concepts (defining forestry, forestry management, utilization, and distribution of forest resources)	1	(1)	8436-A
2. Reviewing the Forestry Pre-Management Era (utilization era - before 1900)	2	(1)	8436-B
3. Describing the Forestry Management Era (federal assistance era - 1900s)	2	(1)	8436-C
B. Practice Forestry Dendrology Skills	11		
1. Recognizing Tree Morphology (tree anatomy, growth, etc.)	2	(2)	8437-A
2. Identifying Trees by Leaf Characteristics (margins, venations, shapes, arrangements, types, keying, etc.)	3	(2)	8437-B
3. Identifying Trees by Bark, Twig, and Bud Characteristics (arrangements, colors, textures, keying, etc.)	3	(2)	8437-C
4. Identifying Trees by Wood Characteristics (colors, textures, odors, etc.)	3	(2)	8437-D
C. Learn Forestry Biometrics Skills (mensuration techniques and tools)	17		
1. Calculating Tree Volume (board feet, cubic feet, cordage, tonnage, etc.)	3	(3)	8438-A
2. Determining Timber Growth and Yield (site index, productivity, growth tables, etc.)	5	(3)	8438-B
3. Cruising Timber Stands (area measurement, photogrammetry aerial photos, sample plot options, estimating value, etc.)	5	(3)	8438-C
4. Scaling Logs (determining quality and volume based on defect, taper, knot size, etc.)	4	(3)	8438-D

* Refer to footnote on page 6

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials*
D. Perform Forestry Management Skills	20		
1. Examining Options for Forest Management Plans and Prescriptions (cutting systems, reforestation, timber stand improvements, chemicals, specialty tree crops, etc.)	5	(4)	8439-A
2. Identifying Multiple-Uses of Forests and Environmental Protection Concerns (impact of forest practices on water, wildlife, recreation, grazing, etc.)	5	(4)	8439-B
3. Controlling Destructive Agents of Forests (fire, insects, diseases, prevention and suppression, etc.)	5	(a)(4), (4)	8439-C
4. Recognizing Principles of Forest Economics (evaluating investment alternatives for resource development)	3	(a)(6)(G), (4)	8439-D
5. Locating Sources of Forestry Management Assistance (public, private, consultants, etc.)	2	(4)	8439-E
E. Recognize Pine and Hardwood Forest Utilization Practices	7		
1. Identifying Timber Harvesting Practices and Equipment (tractor/skidder; high-lead, skyline; helicopter, etc.)	3	(a)(4), (5)	8440-A
2. Describing Timber Merchandising Practices (lump-sum vs. scaled; appraisal styles, etc.)	4	(5)	8440-B
F. Describe the Role of Wood Technology in Forest Product Development	8		
1. Examining the History and Components of Wood Technology	2	(6)	8441-A
2. Comparing Primary Timber Manufacturing Processes and Products (sawnwood, plywood, paper, particle-board, laminates, etc.)	4	(6)	8441-B
3. Examining Secondary Timber Manufacturing Processes and Products (fuelwood, cooperage, shakes, charcoal, bedding, bark mulch, etc.)	2	(6)	8441-C

* Refer to footnote on page 6

Units and Topics of Instruction	Periods of Instruction	Essential Elements	Instructional Materials*
G. Identify Trends in Research and Development (R&D) in Forestry and Wood Technology	2		
1. Recognizing R&D Priorities and Applications in Forestry	1	(7)	8442-A
2. Reviewing R&D Priorities and Applications in Wood Technology	1	(a)(4), (7)	8442-B
H. Explore Career Opportunities in Forestry and Wood Technology	2		
1. Recognizing Careers and Activities in Forestry	1	(a)(2)(A-L) (a)(3)(A-D) (8)	8443-A 1050 2902
2. Evaluating Careers and Functions in Wood Technology	1	(a)(2)(A-L) (a)(3)(A-D) (8)	8443-B 1050 2902
I. Manage Records Related to Forestry and Wood Technology	4		
1. Maintaining and Analyzing Records Related to Forestry	2	(a)(6)(A-I) (a)(7) (9)	SAEP-E, SAEP-G SAEP-J, 383-A 8001, 8002A 8502, 8002C 2852, 2853
2. Maintaining and Analyzing Records Related to Wood Technology	2	(a)(6)(A-I) (a)(7) (9)	SAEP-J, 383-S 8001, 8002A 8502, 8002C 8002B, 8002D 2852, 2853
J. Plan and Conduct Leadership Activities Related to Forestry and Wood Technology	4		
1. Developing Leadership Skills Related to Forestry and Wood Technology	2	(a)(1)(A-D) (a)(5)(A-F) (10)	4850 series 4860 series 8003-8004A
2. Participating in Leadership Activities Related to Forestry and Wood Technology	2	(a)(1)(A-D) (a)(5)(A-F) (10)	4850 series 4860 series 8003-8004A

* Complete Set of Student Material Topics for Agriscience 383 (8446 for unbound set) (8446B for bound set)
Gummed Labels for Daily/Weekly Lesson Plans in Agriscience 383 (L383)
Key to Answers for the Topic Mastery items in 8446 and 8446B (4935)
Pre-Tests/Post-Tests for Topics of Instruction in Agriscience 383 (T383)
Key to Answers for T383 (K383)
Certificates of Completion for Students Enrolled in Agriscience 383 (9066E)

GOALS

AND

OBJECTIVES

FOR

TOPICS

IN

AGRISCIENCE 383

UNIT A
EXPLORE THE HISTORICAL SIGNIFICANCE OF FORESTRY

Topic A-1: Introducing Forestry Concepts

Topic Goal:

The student shall be provided the opportunity to become familiar with the basic definitions of forestry, forest management, and forest utilization, and the distribution of forestry resources.

Topic Objectives:

After completing the topic, the student shall be able to:

1. define forestry, recognize the importance of forestry, and describe the multiple-uses of forests;
2. define forest management and locate the major forest regions of the state, region, nation, and world; and
3. define forest utilization and describe major forest products.

Topic A-2: Reviewing the Forestry Pre-Management Era

Topic Goal:

The student shall be provided the opportunity to study the historical significance of forest utilization practices before 1900 as a basis for recognizing present-day forest management principles and techniques.

Topic Objectives:

After completing the topic, the student shall be able to:

1. discuss the public mentality toward forest resources in the period between colonization and 1900;
2. identify the nature and impact of early utilization on the development of forest conservation practices;
3. assess the political and economic conflicts surrounding early forest conservation efforts and legislation and the personalities involved; and
4. define terms employed in forest utilization: timber, logging, lumbering, naval stores, etc.

Topic A-3: Describing the Forest Management Era

Topic Goal:

The student shall be provided the opportunity to trace the evolution of forest management policies on public and private lands from 1900 to the present as a means of evaluating the complexity of forest resources allocation to meet the needs of all segments of society.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the development of federal assistance in forest management at the national level since 1900;
2. discuss how forest management in the South (and Texas, in particular) reacted to the demand for forest products and the need for forest conservation practices from 1900 to the present;
3. distinguish between commercial and non-commercial forests; and
4. define general terms used in forest management: dendrology, mensuration, silviculture, multiple-use, environmental protection, prescriptions, etc.

UNIT B
PRACTICE FOREST DENDROLOGY SKILLS

Topic B-1: Recognizing Tree Morphology

Topic Goal:

The student shall be provided the opportunity to identify morphological characteristics of trees as a means of practicing dendrology skills.

Topic Objectives:

After completing the topic, the student shall be able to:

1. recognize classification of trees as to species, age, size, and relative stature in the forest stand;
2. explain the use of scientific names and common names to identify trees;
3. discuss tree growth;
4. develop the use of "keys" to identify trees on the basis of characteristics of leaves, twigs, bark, buds, and wood; and
5. define terms used in dendrology: morphology, photosynthesis, genera, family, species, respiration, osmosis, texture, etc.

Topic B-2: Identifying Trees by Leaf Characteristics

Topic Goal:

The student shall be provided the opportunity to study leaf characteristics as a means of identifying tree species.

Topic Objectives:

After completing the topic, the student shall be able to:

1. name parts of a leaf;
2. identify leaf types and shapes;
3. recognize types of leaf margins;
4. list types of leaf venations;
5. discuss types of leaf arrangements;
6. use a "key" to identify tree species by leaf characteristics; and
7. define terms used in leaf recognition: venation, petiole, margin, mid-rib, lanceolate, dendate, pinnate, etc.

Topic B-3: Identifying Trees by Bark, Twig, and Bud Characteristics

Topic Goal:

The student shall be provided the opportunity to examine bark, twigs, and buds as a means of identifying trees.

Topic Objectives:

After completing the topic, the student shall be able to:

1. name parts of a twig;
2. recognize the differences in the presence and arrangement of buds and scars among tree species;
3. identify bark colors and textures on twigs and mature tree boles;
4. determine a tree species by use of a "key" involving bark, twig, and bud characteristics; and
5. define terms used to describe twig structure: node, internode, terminal bud, superposed bud, lateral leaf bud, bundle scar, lenticel, terminal bud scale scar, pith, stipule scar, flower bud, bud scale, twig scar, false terminal bud, etc.

Topic B-4: Identifying Trees by Wood Characteristics

Topic Goal:

The student shall be provided the opportunity to recognize types of wood as a means of identifying trees and examining uses for wood and timber by-products.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify colors of wood;
2. recognize textures of wood;
3. detect distinct odors of wood;
4. identify trees through wood characteristics;
5. examine uses for wood and its by-products; and
6. define terms used in wood structure: cellulose, lignin, porous, non-porous, specific gravity, bending, resin canal, hardwood, softwood, etc.

UNIT C
LEARN FORESTRY BIOMETRICS SKILLS
(MENSURATION TECHNIQUES AND TOOLS)

Topic C-1: Calculating Tree Volume

Topic Goal:

The student shall be provided the opportunity to use mensuration techniques and tools as a means of calculating wood volume.

Topic Objectives:

After completing the topic, the student shall be able to:

1. measure tree diameter and height and separate logs in standing trees for more accurate volume and quality determination;
2. identify methods involved in determining individual tree volumes;
3. recognize means of deducting volume for defect and excessive taper;
4. describe tools used in determining tree volume: dendrometer, tree caliper, Biltmore stick (Merritt scale), hypsometer, Abney level, Haga altimeter, Sunto clinometer, etc; and
5. define terms used in tree measurement: mensuration, diameter breast height, form class, merchantable height, etc.

Topic C-2: Determining Timber Growth and Yield

Topic Goal:

The student shall be provided the opportunity to use mensuration techniques and tools as a means of determining timber growth and yield.

Topic Objectives:

After completing the topic, the student shall be able to:

1. use proper tools and methods to determine tree age;
2. estimate growth rates of trees (increase in diameter per year);
3. combine growth rates with sample volume/tree data to determine how diameter increase reflects increase in volume/acre and potential timber yield in the future;
4. use site index and basal area as other expressions of timber growing capacity;
5. describe how timber stand conditions can influence growth (weather patterns, soil conditions, proximity of crowns, etc.);
6. explain relationship of timber stand improvements (i.e. pre-commercial thinning) on growth rate; and
7. define terms used in timber growth analysis: increment core, summer wood vs. spring wood, compression wood, false rings, basal area, site index, productivity, growth rate, sustained yield, etc.

Topic C-3: Cruising Timber Stands

Topic Goal:

The student shall be provided the opportunity to learn how to combine timber stand sampling methods and area mapping techniques with basic mensurational skills in order to conduct an inventory of merchantable volume of standing timber.

Topic Objectives:

After completing the topic, the student shall be able to:

1. use compass and pacing/chaining techniques to survey the boundaries of the timber stand area being sampled;
2. plot bearings and distances on scaled grid paper to determine the area of the timber stand;
3. apply techniques of photogrammetry to facilitate area measurement and set up inventory plans;
4. recognize random tree sampling methods and reliable fixed/variable plot designs that will facilitate cruising large timber stands;
5. calculate the volume of standing timber on a given tract and assess reliability of sampled data;
6. determine how timber value can be derived from data on volume and quality of commercial species present;
7. develop a cruise report that incorporates timber volume with other factors that affect the cost of harvesting the timber being cruised (topography, soil conditions, adjacent ownerships, rights-of-way, road building needs, environmental concerns, etc.);

8. use tools commonly utilized in timber cruising: topographic map, dot grid, tally sheet, stereoscope, compass, prism, protractor, engineer's scale, etc.; and

9. define terms used in timber inventory: cruising, cruising options (100% strip, partial, plots, ocular, etc.), photogrammetry, tally, etc.

Topic C-4: Scaling Logs

Topic Goal:

The student shall be provided the opportunity to use techniques and tools to determine the commercially useable volumes of unprocessed logs.

Topic Objectives:

After completing the topic, the student shall be able to:

1. accurately measure log dimensions and reliably estimate the impact on volume and quality (log grade) caused by defects (knots, deformities, rot, etc.);

2. determine log volume using the appropriate log rule;

3. illustrate how "volume" determination depends on the product to be derived (sawnwood, plywood veneers, pulp, poles and pilings, ties, etc.);

4. see the relationship of log scaling to the development of more accurate "standing tree" volume tables;

5. apply the tools used in log scaling [log tape, scaling stick, pick (defect), hammer, etc.]; and

6. define terms used in log scaling: taper, log grade, sweep, crook, heart shake, pitch seam, blue stain, weight scale, trim allowance, etc.

UNIT D
PERFORM FORESTRY MANAGEMENT SKILLS

Topic D-1: Examining Options for Forest Management Plans and Prescriptions

Topic Goal:

The student shall be provided the opportunity to recognize the criteria for designing long-term management strategies and short-term silvicultural applications.

Topic Objectives:

After completing the topic, the student shall be able to:

1. recognize the influence of resource conditions, markets, and environmental protection concerns on management plan design (as they affect federal/state-level management and large/small private land management);

2. compare the different methods of harvesting to select those that are appropriate for the production and protection goals of the management plan (intermediate, selective, clear-cut, etc.);

3. differentiate among the silvicultural practices available and match them to the actual resource situation in order to design the best prescriptions;

4. explain timber stand improvements (TSI) such as pre-commercial thinnings, hardwood abatement using chemical herbicides, controlled burns, etc.;

5. describe reforestation techniques;

6. define terms used in forest management: stand condition, timber type, growth rate, crown classification, environmental protection, harvest method, etc.; and

7. define terms used in silvicultural practices: prescription, thinning/clearing, improvement cuttings, burning, salvage, planting dibble, chemical application options (foliage, basal, aerial), etc.

Topic D-2: Identifying Multiple-Uses of Forests and Environmental Protection Concerns

Topic Goal:

The student shall be provided the opportunity to examine non-commercial uses of forests and assess the high priority given to the social value of protecting the general ecosystem that a natural forest represents.

Topic Objectives:

After completing the topic, the student shall be able to:

1. appreciate the historical evolution of forest practices legislation and its serious impact upon all aspects of forest management;

2. describe the effect of forest management on watershed and water resources protection;

3. discuss the value of forests for livestock grazing;

4. explain the great emphasis on wildlife habitat protection, the concept of endangered species, and the political power of conservation groups to influence forest management decisions;

5. identify the role of recreational uses and the increasing public involvement in developing forestland management guidelines;

6. assess the emerging role of urban forestry and its potential influence on public opinion concerning forestry matters; and

7. define terms used in evaluating multiple-use and environmental protection of forests: ecology, forest practices, habitat, endangered, Water Pollution Control Act, direct-control, forestry board, performance bond, etc.

Topic D-3: Controlling Destructive Agents of Forests

Topic Goal:

The student shall be provided the opportunity to recognize control measures for destructive agents of forests as a means of managing woodland productivity.

Topic Objectives:

After completing the topic, the student shall be able to:

1. know types and effects of forest fires;

2. identify major insect pests of trees and their control;

3. recognize major diseases of trees and their control;

4. discuss effects of weather and pollution on forests; and

5. define terms used in control of destructive agents of forests: wildfire, forest fuel, fire suppression, fire fighting, forest pathology, entomologist, terminal feeder, seed insects, parasitic disease, non-parasitic disease, integrated pest management (IPM), winterkill, windfalls, acid deposition, ozone, etc.

Topic D-4: Recognizing Principles of Forest Economics

Topic Goal:

The student shall be provided the opportunity to investigate how options for investments in forest resource development are evaluated by public agencies, timber-using industries, and private landowners.

Topic Objectives:

After completing the topic, the student shall be able to:

1. distinguish between economic and social values for forest resources and appreciate the principle of cost-benefit analysis in selecting alternative uses;

2. recognize the status of forestry and forest products as a component of the regional and national economies;

3. discuss the basic economic factors that have the greatest direct influence on timber management investments (cost of land, taxes, timber supply and demand, harvest cost, return on investment, etc);

4. distinguish the differences in perspectives toward and incentives for investing in forest resource improvements among (a) public agencies, (b) timber-using industries, and (c) private forestland owners; and

5. define terms used in forest economics: average annual percentage growth, interest, ad valorem, severance tax, biological and economic potential, capital gain, depletion allowance, etc.

Topic D-5: Locating Sources of Forestry Management Assistance

Topic Goal:

The student shall be provided the opportunity to identify sources of forest management assistance as a means of enhancing woodland productivity.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify public sources of assistance for forest management;

2. recognize private sources of assistance for forest management;

3. locate institutional sources of assistance for forest management; and

4. define terms used in forestry management assistance: consulting forester, forest technician, Agricultural Conservation Program, Forest Incentives Program, tree farm, etc.

UNIT E
RECOGNIZE PINE AND HARDWOOD FOREST UTILIZATION PRACTICES

Topic E-1: Identifying Timber Harvesting Practices and Equipment

Topic Goal:

The student shall be provided the opportunity to observe timber harvesting procedures as a means of improving woodland utilization.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain conventional and new methods of harvesting timber and the relationship of the logging plan and contract to long-term forest management objectives;
2. describe the sequence of functions, the type of equipment, and the basic principles for cost effectiveness and coordination in a typical logging operation;
3. discuss the considerations for environmental protection, cleanup, and performance guarantees that should be incorporated in logging contract specifications;
4. recognize safety practices in timber harvesting; and
5. define terms used in timber harvesting: logging plan, performance bond, high-lead, sky-line, felling/bucking, choking/skidding, wind-fall, barber-chair, grapple/tong, cherry-picker/knuckle-boom, etc.

Topic E-2: Describing Timber Merchandising Practices

Topic Goal:

The student shall be provided the opportunity to investigate timber merchandising practices as a means of improving woodland utilization.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain how to arrive at a "stumpage appraisal" of the resource to be harvested;
2. recognize the variations in timber sale formats, the end products for which they are best used, and the impact of proper sale preparation and logging procedures on the outcome of each (lump-sum, individual tree, tree scale, load scale, and weight);
3. review the strategies behind product-oriented bids and competitive (multi-buyer) bids;
4. discuss the components of a basic written timber sale contract and the purpose of each component for seller/buyer protection; and
5. define terms used in timber merchandising: lump-sum versus "scaled" sales, bidding, method of payment, timber title guarantee, etc.

UNIT F
DESCRIBE THE ROLE OF WOOD TECHNOLOGY IN FOREST PRODUCT DEVELOPMENT

Topic F-1: Examining the History and Components of Wood Technology

Topic Goal:

The student shall be provided the opportunity to identify the development of wood technology and the important role it occupies in the improvement of forest products.

Topic Objectives:

After completing the topic, the student shall be able to:

1. discuss the evolution of wood technology as a distinct discipline and its contribution to forest product development;
2. explain the basic characteristics of wood structure and properties;
3. describe the basic aspects of wood technology and how each category affects improvements in product design, marketability, and competitiveness with other substitute materials; and
4. define terms used in wood technology: cellulose, lignin, porosity, classifying, seasoning, drying, laminates, dimensional stability, stress, etc.

Topic F-2: Comparing Primary Timber Manufacturing Processes and Products

Topic Goal:

The student shall be provided the opportunity to explain primary timber manufacturing processes and products and their impact on improving woodland utilization.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify primary timber manufacturing processes;
2. recognize primary products manufactured from timber;
3. estimate the demand for primary products in the Southern USA and Texas and the dependence on other regions for supplies; and
4. define terms used in primary timber manufacturing processes and products: sawmill, debarking, sawing, chipping, shaping, peeling, cooking, drying, wood preservation, lumber, paper, veneer, plywood, composites, poles and piling, railroad crossties, fence posts, furniture, tool handles, charcoal, etc.

Topic F-3: Examining Secondary Timber Manufacturing Processes and Products

Topic Goal:

The student shall be provided the opportunity to explore secondary timber manufacturing processes and products and their function in the improvement of woodland utilization.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify secondary timber manufacturing processes;
2. recognize secondary products manufactured from timber;
3. estimate the demand for secondary products in the Southern USA and Texas and the dependence on other regions for supplies; and
4. define terms used in secondary timber manufacturing processes and products: fuelwood, cooperage, pallets, shakes, chips, bedding, bark mulch, etc.

UNIT G
IDENTIFY TRENDS IN RESEARCH AND DEVELOPMENT (R&D) IN FORESTRY AND WOOD TECHNOLOGY

Topic G-1: Recognizing R&D Priorities and Applications in Forestry

Topic Goal:

The student shall be provided the opportunity to identify current trends in and future projections for research and development in forestry as a means of improving woodland utilization.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the priorities for research and development in the areas of tree improvement, silvicultural practices, logging techniques and equipment, forest protection, and environmental protection policy formulation;
2. recognize the future challenges facing forest management at the state, regional, and national levels and the proposals for dealing with them;
3. identify the agencies and institutions responsible for major efforts in forest management research and development; and
4. define terms used in forest management research and development: biomass, ecosystem, pathology, fire science, stratification, genetic alteration, etc.

Topic G-2: Reviewing R&D Priorities and Applications in Wood Technology

Topic Goal:

The student shall be provided the opportunity to identify current activities in and future projections for research and development in wood technology as a means of forecasting the potential for growth in the forest products industry.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the priorities for research and development in forest products manufacturing (processes, products, by-products, and derivatives);
2. recognize trends in improving waste management and recycling forest products;
3. identify the agencies and institutions responsible for major efforts in forest products research and development; and
4. define terms used in wood technology research and development: composites, glu-lam, beam shear, adhesives, preservatives, shrinkage, extractives, residue utilization, etc.

UNIT H
EXPLORE CAREER OPPORTUNITIES IN FORESTRY AND WOOD TECHNOLOGY

Topic H-1: Recognizing Careers and Activities in Forestry

Topic Goal:

The student shall be provided the opportunity to observe career opportunities and occupational activities in forestry as a means of attaining gainful employment in forestry.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify interests, values, attitudes, education, and other qualities necessary for a career or occupation related to forestry;
2. recognize career clusters and duties related to forestry;
3. examine occupations related to forestry;
4. analyze supply and demand trends for employment related to forestry; and
5. name sources of possible employment in the forestry profession.

Topic H-2: Evaluating Careers and Functions in Wood Technology

Topic Goal:

The student shall be provided the opportunity to observe career opportunities and occupational activities in wood technology as a means of attaining gainful employment in the wood industries.

Topic Objectives:

After completing the topic, the student shall be able to:

1. identify interests, values, attitudes, education, and other qualities necessary for a career or occupation related to wood technology;
2. recognize career clusters and duties related to wood technology;
3. examine occupations related to wood technology;
4. analyze supply and demand trends for employment related to wood technology; and
5. name sources of possible employment in wood technology.

UNIT I
MANAGE RECORDS RELATED TO FORESTRY AND WOOD TECHNOLOGY

Topic I-1: Maintaining and Analyzing Records Related to Forestry

Topic Goal:

The student shall be provided the opportunity to learn recordkeeping skills, analyze the data, and apply the results to forest management situations as a means of improving resource use efficiency.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the types of records commonly used in forest management and their purposes;
2. develop results from data collected (mathematical calculations, tables, graphs, etc.);
3. interpret the results of data as they apply to that particular phase of forest management and as they impact related resources; and
4. prepare management decisions (silvicultural practice, policy directive, or operational adjustment) indicated by the recordkeeping process.

Topic I-2: Maintaining and Analyzing Records Related to Wood Technology

Topic Goal:

The student shall be provided the opportunity to learn recordkeeping skills, analyze the data, and apply the results to procedures and processes in wood technology as a means of improving forest product manufacture and development.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the basic types of records utilized in wood technology and their purposes;
2. develop results from data collected (mathematical calculations, charts, graphs, tables, etc.);
3. interpret the results of data as they apply to that particular material or product characteristic and as they impact product development; and
4. prepare recommendations for research, design, production, or marketing based upon the recordkeeping process.

UNIT J
PLAN AND CONDUCT LEADERSHIP ACTIVITIES RELATED TO FORESTRY AND WOOD TECHNOLOGY

Topic J-1: Developing Leadership Skills Related to Forestry and Wood Technology

Topic Goal:

The student shall be provided the opportunity to cultivate leadership skills for use in a forestry or wood technology career and throughout the lifetime.

Topic Objectives:

After completing the topic, the student shall be able to:

1. explain the importance of effective leadership skills in a democracy;
2. recognize skills necessary for effective leadership;
3. describe characteristics of an effective leader;
4. demonstrate leadership skills; and
5. evaluate acquired leadership skills.

Topic J-2: Participating in Leadership Activities Related to Forestry and Wood Technology

Topic Goal:

The student shall be provided the opportunity to implement leadership activities related to forestry or wood technology.

Topic Objectives:

After completing the topic, the student shall be able to:

1. participate as member and chair of committees;
2. serve as member and presiding officer of large group meetings;
3. use acceptable parliamentary procedures;
4. act on proposals presented by organizations; and
5. participate in research activities.